CLAIMS:

1. A method for making and screening a combinatorial library, comprising:

disposing on a substrate comprising aluminum at least one reactant comprising lithium, germanium, magnesium, or a combination comprising at least one of the foregoing;

heat treating the substrate to create a diffusion multiple having at least two phases;

contacting the diffusion multiple with hydrogen;

detecting any absorption of hydrogen; and/or

detecting any desorption of hydrogen.

2. The method of Claim 1, wherein the reactant is elemental lithium, germanium, magnesium, or a combination comprising at least one of the foregoing elements.

3. The method of Claim 1, wherein potassium and/or sodium are further disposed adjacent to at least one of lithium, germanium, magnesium or combination thereof.

4. The method of Claim 1, wherein the heat treatment is conducted at a temperature of about 400 to about 600°C.

5. The method of Claim 1, wherein at least one reactant is disposed in the substrate and forms a binary couple upon heat treatment.

6. The method of Claim 1, wherein at least two reactants are disposed in the substrate and form a ternary triple upon heat treatment.

7. The method of Claim 1, further comprising identifying and analyzing at least one phase of the diffusion multiple using electron microprobe analysis.

8. The method of Claim 1, further comprising slicing and grinding the diffusion multiple.

9. The method of Claim 8, further comprising analyzing the diffusion multiple by electron microprobe analysis or electron backscatter diffraction.

10. The method of Claim 8, wherein the slicing and grinding of the diffusion multiple is conducted after the heat treatment.

11. The method of Claim 1, wherein the determining of the suitability of at least one phase for the absorption of hydrogen is conducted by time of flight secondary mass ion spectrometry, thermal imaging or by using a tungsten oxide detector.

12. A method of recovering hydrogen comprising:

contacting at least one compound in hydrogen to form a hydrogenated compound; wherein the compound is AlLi, Al_2Li_3, Al_4Li_9, Al_3Mg_2, $Al_{12}Mg_{17}$, AlB_{12}, Ge_4K, GeK, GeK_3, $GeLi_3$, Ge_5Li_{22}, Mg_2Ge, Ge_4Na, GeNa, $GeNa_3$, aluminum doped Ge_4K, aluminum doped GeK, aluminum doped GeK_3, aluminum doped $GeLi_3$, aluminum doped Ge_5Li_{22}, aluminum doped Mg_2Ge, aluminum doped Ge_4Na, aluminum doped GeNa, aluminum doped $GeNa_3$, or a combination comprising at least one of the foregoing compounds; and

heating the hydrogenated compound to recover the hydrogen.

13. The method of Claim 12, wherein the heating is conducted using microwave radiation, convectional heating, electrical resistive heating, or a combination comprising at least one of the foregoing methods of heating.

14. The method of Claim 12, further adding a dopant comprising titanium, vanadium zirconium, yttrium, lanthanum, nickel, manganese, cobalt, silicon, gallium, germanium, and the elements from the lanthanide series to the compound in an amount of less than or equal to about 20 wt% of the compound.

15. The method of Claim 12, wherein the heating is effected by the heat from the exhaust of a fuel cell.

16. An energy generation device, wherein the method of Claim 12 is employed to generate energy.

17. A diffusion multiple containing compounds having the formula (II) or the formula (III)

$$(Li_a, Na_b, Mg_c, K_d, Ca_e, Ge_f)_x (Al)_y \qquad (II)$$

$$(Li_a, Na_b, Mg_c, K_d, Ca_e, Al_f)_x (Ge)_y \qquad (III)$$

where Li is lithium, Na is sodium, Mg is magnesium, K is potassium, Ca is calcium, Ge is germanium, Al is aluminum; a, b, c, d, e and f may be the same or different and have values from 0 to 1; x and y have values of 1 to 22; wherein at least one phase of the diffusion multiple absorbs hydrogen.

18. The diffusion multiple of Claim 17, wherein the sum of a, b, c, d, e, and f is equal to 1.

19. A composition comprising:

a hydride of a compound, wherein the compound is AlLi, Al_2Li_3, Al_4Li_9, Al_3Mg_2, $Al_{12}Mg_{17}$, AlB_{12}, Ge_4K, GeK, GeK_3, $GeLi_3$, Ge_5Li_{22}, Mg_2Ge, Ge_4Na, GeNa, $GeNa_3$, aluminum doped Ge_4K, aluminum doped GeK, aluminum doped GeK_3, aluminum doped $GeLi_3$, aluminum doped Ge_5Li_{22}, aluminum doped Mg_2Ge, aluminum doped Ge_4Na, aluminum doped GeNa, aluminum doped $GeNa_3$, or a combination comprising at least one of the compounds.

20. A system for the storage and recovery of hydrogen comprising:

a hydrogen generation reactor in fluid communication with a hydride recycle reactor, wherein the hydrogen generation reactor utilizes hydrides of light metal aluminides and germanides to recover hydrogen.

21. The system of Claim 20, wherein the hydrogen generation reactor is in fluid communication with and down stream of a slurry production reactor.

22. The system of Claim 20, wherein the hydrogen generation reactor is in fluid communication with and up stream of a drying and separation reactor.

23. The system of Claim 21, wherein the slurry production reactor is in fluid communication with and downstream of a drying and separation reactor.

24. The system of Claim 20, wherein the hydride recycle reactor is in fluid communication with a slurry production reactor.

25. The system of Claim 20, wherein a metal hydride slurry is transferred to the hydrogen generation reactor from a slurry production reactor.

26. The system of Claim 20, wherein a regenerated metal hydride is transferred from the hydride recycle reactor to a slurry production reactor.

27. The system of Claim 20, wherein water is introduced into the hydrogen generation reactor.

28. The system of Claim 20, wherein hydrogen is generated in the hydrogen generation reactor by the use of heat from microwave radiation, convective heat, exhaust heat from a fuel cell.